GEORGIA'S PROTECTED FISHES: THE NEED FOR BASIN-WIDE MANAGEMENT

Byron J. Freeman

AUTHOR: Assistant Research Scientist, Institute of Ecology, University of Georgia, Athens, Georgia 30602.
REFERENCE: Proceedings of the 1993 Georgia Water Resources Conference, held April 20 and 21, 1993, at The University of Georgia, Kathryn J. Hatcher, Editor, Institute of Natural Resources, The University of Georgia, Athens, Georgia.

Abstract. The occurrence of multiple state and federal protected species in the same waterseds in Georgia, points out a need for a basin wide approach to managing water quality and water use. Many of these species are endemic to the upper Coosa River system in North Georgia, adjacent to the rapidly growing metro-Atlanta area. Land-use management decisions, especially in this region of Georgia, should address the potential conflicts between biodiversity issues and projects which can impact water quality, as part of a long range planning strategy in order to maximize maintenance of natural environments as well as insure the continued availability of high quality water sources.

INTRODUCTION

The State of Georgia recently recognized 55 fishes and 9 freshwater mussels as protected species, as defined by the Georgia Protected Wildlife Act. Six of these fishes are federally listed as threatened or endangered, and 8 more are either proposed for listing or are being reviewed for listing. Many of these jeopardized animals represent endangered faunal assemblages, evidenced by co-occurrence of listed species in particular basins or sections of rivers. A comprehensive, basin wide approach to faunal protection and eventual species recovery offers the best strategy for maintaining what remains of the diverse, southeastern aquatic fauna, as opposed to reactionary piecemeal efforts that occur in the face of individual threats.

We generally recognize the existence of sensitive species only when habitat deterioration or fragmentation has occurred to such a degree that some species can no longer maintain viable populations. Species most often become endangered because their habitat becomes endangered. Jeopardized faunal assemblages are in trouble because of jeopardy to the ecosystem in which their habitats occur. Water resource managers will increasingly find themselves challenged by the collision between the constant quest for additional water sources and the need to maintain functioning ecosystems and landscapes - not only for protected species, but for clean air and water, recreation, commercially valuable wildlife and other natural resources.

Endangered species serve as indicators of dysfunctioning ecosystems and disturbed landscapes. This particularly applies to riverine species, because the quality of their habitat may suffer from disturbances occurring far upstream or from the accumulated effects of poor management practices throughout the basin. Although all components of aquatic communities are potentially vulnerable to habitat deterioration, fishes are most often the focus of species protection efforts. This primarily reflects how little we know about diversity and distribution of freshwater invertebrates relative to fishes. Nonetheless, characteristics of local fish assemblages arguably integrate many aspects of stream community well-being (Karr et al., 1986). This paper discusses the greatest threats to Georgia's protected fishes, and uses the Etowah River fauna to illustrate the necessity of evaluating project impacts in the context of overall basin development.

THE ETOWAH RIVER EXAMPLE

The Etowah River system in northwest Georgia provides a good case study of the challenges resource managers and planners are likely to encounter over the next 10 years. The system traverses a landscape currently dominated by farmland and woodlands, although it is adjacent to the rapidly growing metro-Atlanta area. The upper Etowah system, above Allatoona Reservoir, contains populations of federally listed, proposed and candidate species, as well as state-protected species. Many of these species no longer occur downstream from Allatoona Reservoir, and together represent an isolated, remnant fauna, presumably once more widespread in the Coosa River system in Alabama and Georgia.

The amber darter Percina antesella, federally listed as endangered, lives in shoal habitat in the mainstem Etowah and some larger tributaries. The frecklebelly madtom Noturus munitus, the freckled darter Percina lenticula, and the rock darter Etheostoma rupestre, all status review species, also occupy Etowah River shoals. The Etowah

darter Etheostoma sp. cf. jordani, is endemic to the Etowah River system above Allatoona Reservoir, and is under consideration for federal protection (N. M. Burkhead, USFWS, personal communication). The Cherokee darter Etheostoma sp. lives in riffle habitat of tributaries to the Etowah River, and also is a candidate for federal listing.

Much potential habitat for the Etowah and Cherokee darters has already suffered serious degradation, and assignment of protected status to these species means that federal actions on both tributary and mainstem habitat in the Etowah basin may require Endangered Species Act compliance. The blue shiner Cyprinella caerulea, federally listed as threatened, has probably been extirpated from the Etowah (along with at least 6 other fishes and at least 35 species of mussels; Burkhead et al., 1992).

Importance of Life History Information

Detailed life history information and data on habitat requirements are lacking for most of the Etowah's jeopardized fauna. We know enough, however, to conclude that species protection may hinge on preserving habitat over as broad a geographic area as possible, so as to maintain as many separate populations as possible. For example, analysis of habitat use by the amber darter in the upper Conasauga River demonstrates that despite relatively narrow habitat requirements, amber darter abundance fluctuates independently of local habitat availability. Many stream fish populations strongly vary from year to year (see, e. g., Starrett, 1951; Mills and Mann, 1985) raising the possibility that dispersal among populations may be necessary for maintaining a species across its range (Sheldon 1987). As species become restricted to smaller and smaller portions of their original distributions, the potential for extirpation from normal population fluctuations increases. Thus, continued existence of these communities probably depends on protection of habitat quality throughout their remaining distributions.

Impending Development on the Upper Etowah River

Several major projects which pose significant threats to sensitive species are proposed or in planning stages for a 35 to 40 mile section of the upper Etowah River. Two tributary reservoirs, a river side golf course, and a spray irrigation sewage disposal system in the floodplain pose direct, immediate threats. One existing and two proposed mega-landfills pose potential threats over the long term. Additionally, the proposed outer-perimeter developmental highway is expected to cross the Etowah and several tributaries in this sensitive section of the river. The Endangered Species Act requires consideration of cumulative effects during federal review of projects likely to jeopardize the continued existence of listed species. This means that the projects slated for the Etowah basin should not be evaluated independently with respect to their potential impact on jeopardized species. The question of cumulative effects is all the more pressing because of the paucity of high quality habitat remaining not only in the Etowah River, but in other river systems across Georgia.

Tributary reservoirs can directly alter streamflow pattern and water temperature regime downstream, in addition to the fragmentation and loss of stream habitat imposed by the reservoirs themselves. The threat posed by tributary reservoirs in the upper Etowah is exacerbated by the low number of high quality tributaries remaining to feed the river. Not by coincidence, Sharp Mountain Creek and Yellow Creek, both under consideration for water supply impoundments, drain mostly forested watersheds and are sources of high quality water to the Etowah. The projected impacts of these projects on Etowah River fauna would be lessened if sediment and nutrient runoff were not so pervasive in other parts of the basin. The lack of attention to soil erosion and sedimentation controls, readily illustrated by the large amounts of sediment deposited at the mouths of many tributaries feeding the upper Etowah, effectively increases the net impact of development in relatively protected watersheds.

BASIN WIDE MANAGEMENT

The key to solving the conflict between maintaining biodiversity, (especially protected species) and development lies in a basin wide approach to managing water quality and water use. It is not enough for developers to minimize projected impacts of individual projects. The cumulative impact of extensive on stream and near stream development together with poor land-use management will devastate remaining high quality riverine habitat. We must take specific measures to reduce habitat deterioration throughout basins:

- Projects not requiring river access, or potentially hazardous to water quality (e.g., landfills) must not be permitted on or near floodplains and tributary streams. Every project that increases sediment runoff or disturbs riparian forests further restricts availability of high-quality habitat and thus needlessly raises the net impact of subsequent development.
- Diffuse inputs of silt and sediment must be reduced. Silt and sediment are insidious destroyers of stream ecosystem function and can be controlled. Enforcing Soil Erosion and Sedimentation laws provides a relatively cheap way to improve water quality.
- Nutrient amendments to streams and rivers must be reduced. Maintaining intact riparian buffers (e.g., between streams and roads, pastures, cultivated fields) forms an important tool for controlling sediment and nutrient inputs to streams and rivers.
- Maintaining functioning floodplains and riverine wetlands is another important step. These wetlands strongly influence water quality in receiving streams, and yet small wetlands are being whittled away with no

thought for the impact of their cumulative loss on river systems. Intact floodplain and riparian forests should be identified and protected, possibly as mitigation for development in less sensitive areas. Protective conservation easements on sensitive stream side property can benefit landowners and riverine habitat integrity.

- Although abundant, surface water in Georgia obviously is not unlimited. Instream and downstream water requirements place additional constraints on water availability. Water conservation strategies including higher efficiency appliances, more efficient industrial applications, recycling and improved nutrient recovery from wastewater discharges are imperative for improving water availability.

CONCLUSIONS

The diverse aquatic communities native to southeastern rivers are irreplaceable. Whereas we can reconstruct functional riverine components such as riparian forests and wetlands, we can not replace the complex faunal and floral assemblages that evolved in these systems. The rewards from a comprehensive management approach can be enormous, including clean water, diverse biotic assemblages, terrestrial and aquatic recreational opportunities, fish and wildlife habitat and increased property values. However, our only hope for achieving sustainable water resource development, i.e., maximizing offstream use while protecting instream water quality and native biodiversity, is to plan development in the context of cumulative basin wide water use and instream habitat integrity.

LITERATURE CITED

Burkhead, N. M., J. D. Williams, and B. J. Freeman. 1992. A river under siege. Georgia Wildlife 2(2): 10-17.

Karr, J. R., K. D. Fausch, P. L. Angermeier, P. R. Yant, and I. J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Illinois Natural History Survey, Champaigne, Illinois, Special Publication 5.

Mills, C. A. and R. H. K. Mann. 1985. Environmentally-induced fluctuations in year-class strength and their implications for management. J. Fish Biol. 27 (Suppl. A): 209 - 226.

Sheldon, A. L. 1987. Rarity: patterns and consequences for stream fishes. pp. 203 - 209 in W. J. Matthews and D. C. Heins (eds.) Community and Evolutionary Ecology of North American Stream Fishes. Univ. of Oklahoma Press, Norman OK.

Starrett, W. C. 1951. Some factors affecting the abundance of minnows in the Des Moines River, Iowa. Ecology 32: 13 - 27.